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Elementary Statistics: Introduction

The following modules are based on the award-winning *Elementary Statistics* online course by authors Barbara Illowsky and Susan Dean. The content presented here was designed to be used as a complementary resource with their [Collaborative Statistics](#) textbook/collection.

Note: The source documents for this collection can be found at <http://sofia.fhda.edu/gallery/statistics/index.html>.

Course Management

The [Course Syllabus](#) provides instructors a basic framework for teaching this material to their students. This document is intended to serve as a starting point; instructors should use this document as a foundation for creating a learning experience customized to meet their students' unique needs.

Video Lectures

As a part of their [award-winning online course](#), the authors have provided a number of video lectures. These half-hour segments can be used for self-study or as a complement to the [Collaborative Statistics](#) textbook. The authors also provide videos instructing students on the use of the TI-83 calculator as used in the textbook and course activities and exercises.

Lecture Videos

- [Chapter 1: Sampling and Data](#)
- [Chapter 2: Descriptive Statistics](#)
- [Chapter 3: Probability Topics](#)
- [Chapter 4: Discrete Distributions](#)
- [Chapter 5: Continuous Random Variables](#)
- [Chapter 6: The Normal Distribution](#)

- [Chapter 7: The Central Limit Theorem](#)
- [Chapter 8: Confidence Intervals](#)
- [Chapter 9: Hypothesis Testing - Single Mean and Single Proportion](#)
- [Chapter 10: Hypothesis Testing - Two Means, Two Proportions, Paired Data](#)
- [Chapter 11: The Chi-Square Distribution](#)
- [Chapter 12: Linear Regression and Correlation](#)

TI-83 Calculator Video Tutorials

- [TI-83 Calculator Tutorial, Part 1](#)
- [TI-83 Calculator Tutorial, Part 2](#)

Practice Exams, Problem Sets, and Quizzes

A number of practice tests and problem sets are provided for student self-evaluation and to provide opportunities for students to practice key concepts introduced throughout the course. Solutions to these exercises are provided as feedback to aid student retention and understanding. These problem sets may be used as homework assignments or self-directed study aids.

Skills Practice Exams

- [Skills Practice Exam 1: Chapters 1, 2, & 12](#)
- [Skills Practice Exam 2: Chapters 3, 4, 5, & 6](#)
- [Skills Practice Exam 3: Chapters 7, 8, 9, & 10](#)

Practice Final Exams

- [Practice Final Exam 1: Chapters 1 & 2](#)
- [Practice Final Exam 2: Chapters 3 & 4](#)
- [Practice Final Exam 3: Chapters 5, 6, & 7](#)
- [Practice Final Exam 4: Chapters 8, 9, & 10](#)
- [Practice Final Exam 5: Chapter 11](#)
- [Practice Final Exam 6: Chapter 12](#)

In addition to the problem sets provided above, the following multiple-choice quizzes are provided as resources for instructors. These modules can

be used as assignments or as templates for classroom assessments. Answers to these items are not provided.

Quizzes

- [Chapter 1: Sampling and Data](#)
- [Chapter 2: Descriptive Statistics](#)
- [Chapter 3: Probability Topics](#)
- [Chapter 4: Discrete Distributions](#)
- [Chapter 5: Continuous Random Variables](#)
- [Chapter 6: The Normal Distribution](#)
- [Chapter 7: The Central Limit Theorem](#)
- [Chapter 8: Confidence Intervals](#)
- [Chapter 9: Hypothesis Testing - Single Mean and Single Proportion](#)
- [Chapter 10: Hypothesis Testing - Two Means, Two Proportions, Paired Data](#)
- [Chapter 11: The Chi-Square Distribution](#)
- [Chapter 12: Linear Regression and Correlation](#)

Calculator Instructions

The following module contains a number of resources related to the TI-83 calculator and ways it can be used with the [Collaborative Statistics](#) textbook and curriculum. This resource addresses many different function on the calculator, including calculation of the outliers, discrete mean, standard deviation, and random numbers.

- [View the TI-83 Calculator Resources](#)

Elementary Statistics: Exam 2: Lessons 3 & 4

Questions 1 – 4 refer to the following:

The following table classified eighty-two children by age and favorite meals at a McDonald's ® restaurant.

	6 or below	7-12	13-15	Total
Hamburger	6	12	16	34
Chicken Nuggets	9	13	11	33
Filet 'o' fish	2	5	8	15
Totals	17	30	35	82

Age (in years) against favorite foods

Assume a child is randomly selected.

Exercise:

Problem:

Find the probability of being “7-12” years old AND preferring “chicken nuggets”

- A $\frac{13}{82}$
- B $\frac{28}{82}$
- C $\frac{33}{82}$
- D $\frac{13}{61}$

Solution:

A

Exercise:

Problem:

Find the probability of being “13-15” years old OR preferring “Filet’o’fish”.

- A $\frac{8}{82}$
 - B $\frac{50}{82}$
 - C $\frac{8}{51}$
 - D $\frac{42}{82}$
-

Solution:

D

Exercise:

Problem:

Find the probability of “preferring Hamburger” given that the randomly selected child is 13-15 years old.

- A $\frac{16}{82}$
 - B $\frac{16}{35}$
 - C $\frac{16}{34}$
 - D $\frac{16}{70}$
-

Solution:

B

Exercise:

Problem:

The events “preferring Hamburger” and “being 13-15 years old” are:

- **A** Mutually exclusive
 - **B** Independent
 - **C** Neither mutually exclusive or independent.
 - **D** Both mutually exclusive and independent.
-

Solution:

C

Exercise:**Problem:**

E and F are two events such that $P(E) = 0.60$, $P(E \text{ or } F) = 0.90$ and $P(E \text{ and } F) = 0.50$. Find $P(F)$.

- **A** 0.80
 - **B** 0.30
 - **C** 0.40
 - **D** 0.10
-

Solution:

A

Exercise:**Problem:**

The probability that a randomly chosen adult resident of Bayview city owns a boat is 0.16. The probability that a randomly chosen adult rents an apartment is 0.30. The probability that the adult owns a boat given he/she rents an apartment is 0.20.

- A0.048
- B0.24
- C0.10
- D0.06

Solution:

D

Exercise:

Problem: Possessing a boat and renting an apartment are:

- A independent events
- B mutually exclusive
- C both independent and mutually exclusive
- D neither independent nor mutually exclusive

Solution:

D

Questions 8 – 9 refer to the following:

A bag contains 4 red marbles and 5 blue marbles. Two marbles are randomly drawn without replacement.

Exercise:

Problem:

Find the probability of the event “The first marble is red and the second is blue.”

- A $\frac{20}{81}$
- B $\frac{20}{72}$
- C $\frac{4}{12}$
- D $\frac{4}{9}$

Solution:

B

Exercise:

Problem: Find the probability that both marbles are red.

- A $\frac{16}{81}$
- B $\frac{7}{81}$
- C $\frac{12}{72}$
- D $\frac{8}{72}$

Solution:

C

Exercise:

Problem:

Approximately 70% of U. S. adults had at least one pet as a child. We randomly survey 60 U. S. adults. We are interested in the number that had at least one pet as a child. The probability that at least 3 adults had at least one pet as a child means:

- A $P(X = 0) + P(X = 1) + P(X = 2)$
- B $P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3)$
- C $P(X = 4) + P(X = 5) + P(X = 6) + \dots + P(X = 60)$
- D $P(X = 3) + P(X = 4) + P(X = 5) + \dots + P(X = 60)$

Solution:

D

Questions 11 – 12 refer to the following:

A plumber has determined the possible number of house calls to be made each day, and their related probabilities:

$x = \# \text{ of house calls}$	$P(x)$
0	0.10
1	0.40
2	0.25
3	0.15
4	0.10

Exercise:

Problem:

What is the probability that he makes at least 1, but no more than 3 house calls in a day?

- A 0.65
- B 0.80
- C 0.50
- D 0.40

Solution:

B

Exercise:**Problem:**

If the plumber charges a flat fee of \$ 40 for a house call, the expected daily income is:

- A\$70
 - B\$175
 - C\$400
 - D\$1.75
-

Solution:

A

Exercise:

Problem: If $X \sim B(40, 0.2)$, then $P(X > 11) =$

- A0.0432
 - B0.0001
 - C0.0875
 - D0.1608
-

Solution:

C

Exercise:**Problem:**

The Fizz–Full Soda Company knows that 4% of the bottles of soda it produces are filled with less soda than required. If one purchases 10 bottles at random, the probability that at most 2 of these bottles will have less soda than required is:

- A0.0519
- B0.9938
- C0.9418
- D0.0080

Solution:

B

Questions 15 – 16 refer to the following:

Assume the statistics final is a multiple-choice exam with 50 questions, each question having 5 choices, only one of which is correct. Assume you answer all questions at random (guessing).

Exercise:

Problem:

The expected number of questions you would get correct would be:

- A5
- B10
- C40
- D45

Solution:

B

Exercise:

Problem:

Based upon numerical calculations, would you be surprised if a person got exactly half of the questions correct?

- Ayes, because it is impossible
- Byes, because the probability is almost 0
- Cno, because the probability is 0.50

- **D**no, because it is the most likely probability

Solution:

B

Exercise:

Problem:

If sampling without replacement occurs, do the picks follow the Binomial Distribution?

- **A**Yes, because each pick is independent from the others.
- **B**No, because the probability of success on each pick changes.
- **C**Yes, if we are counting the number of successes.
- **D**No, because we may not have any successes.

Solution:

B

Exercise:

Problem:

Ninety-four percent of California community college transfers feel that their community college adequately prepared them to handle upper-division coursework at their transfer university. We randomly survey 14 California community college transfers. We are interested in the number that feel that their community college adequately prepared them to handle upper division coursework at their transfer university. List the values that X , the Random Variable, may take on.

- **A**1,2,3,...,14
- **B**1,2,3,...,94
- **C**0,1,2,...,14
- **D**0,1,2,...,94

Solution:

C

Elementary Statistics: Exam 5: Lesson 11

Exercise:

Problem:

Suppose the random variable X follows a chi-square distribution with degrees of freedom equal to 35. Fill in the blanks.

- A
- B

Solution:

A. 35

B. 8.3666

Exercise:

Problem: Check all that apply.

- **A**The chi-square graph always has the same shape.
- **B**If X follows a chi-square distribution with $df = 200$, then X approximately follows a normal distribution.
- **C**The chi-square distribution is skewed to the right if the degrees of freedom are less than 90.
- **D**The test statistic for the chi-square distribution may be zero.
- **E**A goodness-of-fit hypothesis test is always right-tailed.
- **F**A test of independence tests whether two factors are independent or not.

Solution:

B, C, D, and F

Exercise:

Problem: Write the null and alternate hypotheses for the following:

It is believed that public high school students attend school in equal numbers for each day of the school week. Suppose a sample of the days students were present at school was taken for one particular high school:

- 1750 students were present on Monday
- 1800 students were present on Tuesday
- 1840 students were present on Wednesday
- 1810 students were present on Thursday
- 1800 students were present on Friday

Ho:

Ha:

Solution:

Ho: Public high school students attend school in equal numbers for each day of the school week

Ha: Public high school students DO NOT attend school in equal numbers for each day of the school week

Elementary Statistics: Exam 1: Lessons 1 & 2

Questions 1 – 2 refer to the following:

A sample of 56 employees was taken to determine average pulse rate. The data is in the table below:

Pulse Rate (beats per minute)	Frequency (# of employees)
54	1
58	4
65	7
68	9
72	10
76	4
80	10
84	6
90	3
98	2

Exercise:

Problem: The mode(s) is/are:

- A 74
- B 72 and 80
- C 68
- D the average of 72 and 80

Solution:

B

Exercise:

Problem: The variable is:

- A the number of employees
- B all employees
- C the average pulse rate for the 56 employees
- D the pulse rate of one employee

Solution:

D

Questions 3 – 5 refer to the following:

The table below shows the ages of 50 senior citizens who attend a local senior center.

Age	Frequency	Relative Freq.	Cum. Rel. Freq.
56	9	0.18	

Age	Frequency	Relative Freq.	Cum. Rel. Freq.
63	8		
68	17	0.36	
73	8	0.16	
80	5	0.10	
88	2	0.04	1.00

Exercise:

Problem: Find the IQR.

- A 0.5
- B 17
- C 10
- D not enough information

Solution:

C

Exercise:

Problem: Which interval has the smallest percentage of data?

- A The interval 55.5 to 63.5.
- B The interval 63.5 to 68.5.
- C The interval 68.5 to 73.5.
- D The interval 73.5 to 88.5.

Solution:

D

Exercise:

Problem: What percent of the ages are at most 68?

- A36
 - B70
 - C30
 - D66
-

Solution:

B

Exercise:

Problem:

What can be said about a set of data when its standard deviation is zero?

- AIf the data are ordered, they are very spread out from the mean.
 - BAll of the data appear with the same frequency.
 - CIf the data are ordered, they are very close to but different from the mean.
 - DThere is no mode.
-

Solution:

D

Exercise:

Problem:

For the following data, which measure of central tendency would be the LEAST useful? Data:

4 8 11 11 11 27 27 27 27 27 1000

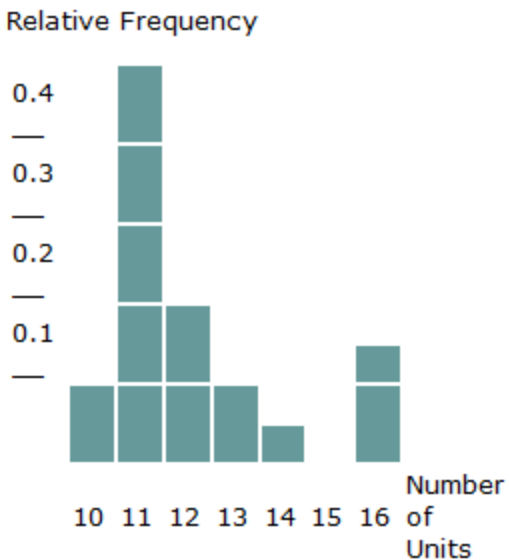
- Amean
- Bmedian
- Cmode
- Dstandard deviation

Solution:

A

Questions 8 – 10 refer to the following:

Sixty (60) college students were asked the number of units they are taking this quarter. The results are given in the following graph:



Exercise:

Problem:

The number of responses that were “12” OR “13” is approximately:

- A18
- B0.3
- C25

- **D**Not enough information

Solution:

A

Exercise:

Problem: The third quartile is:

- **A**15
- **B**14
- **C**13
- **D**12

Solution:

C

# of Videos	Frequency	Relative Frequency	Cum. Rel. Freq.
0	18	0.29	?
1	26	0.41	?
2	?	?	?
3	6	?	?

# of Videos	Frequency	Relative Frequency	Cum. Rel. Freq.
4	1	?	?

Exercise:

Problem:

The sample from the table above was taken by randomly selecting one student from the administration's official list of students and then choosing every 100th. This is an example of what kind of sampling?

- Acluster
- Bsystematic
- Cstratified
- Dconvenience

Solution:

B

Exercise:

Problem:

How should you classify data from the following question: What is your blood pressure?

- Aqualitative
- Bquantitative – discrete
- Cquantitative – continuous

Solution:

C

Exercise:**Problem:**

How should you classify data from the following question: What is your favorite vacation place?

- Aqualitative
- Bquantitative – discrete
- Cquantitative – continuous

Solution:

A

Exercise:**Problem:**

A study is done to determine the average amount of tuition all San Jose State undergraduate students pay per semester. A sample of 100 undergraduate San Jose State students is taken by dividing the students into freshmen, sophomore, junior, and senior years and selecting 25 students from each. Each student is asked how much tuition he/she paid for the Spring 2002 semester. The type of sampling and the parameter are:

- Acluster and the average amount of tuition all San Jose State students paid Spring 2002.
- Bstratified and the average amount of tuition the 100 San Jose State students paid Spring 2002.
- Ccluster and the average amount of tuition the 100 San Jose State students paid Spring 2002.
- Dstratified and the average amount of tuition all San Jose State students paid Spring 2002.

Solution:

D

Elementary Statistics: Exam 3: Lessons 5, 6 & 7

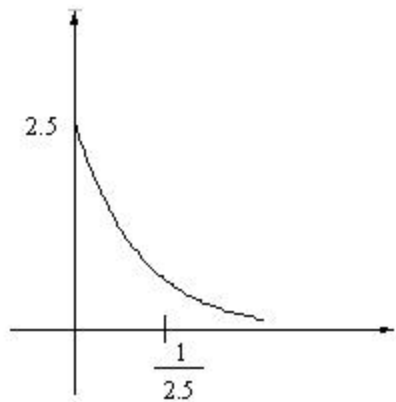
Questions 1 – 3 refer to the following:

Assume the amount of money seventh-grade students spend on food each day at school is exponentially distributed with an average of \$2.50.

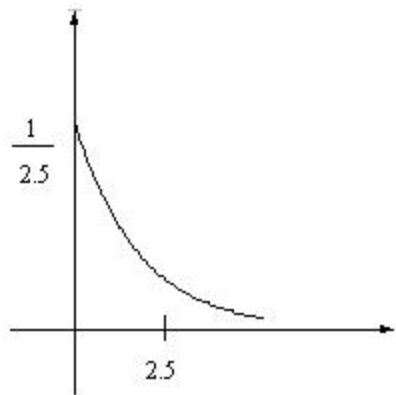
Exercise:

Problem: Which graph best describes the distribution?

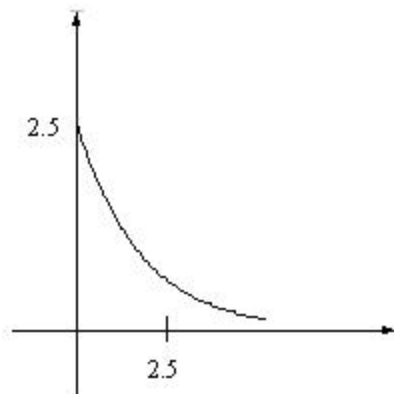
- A



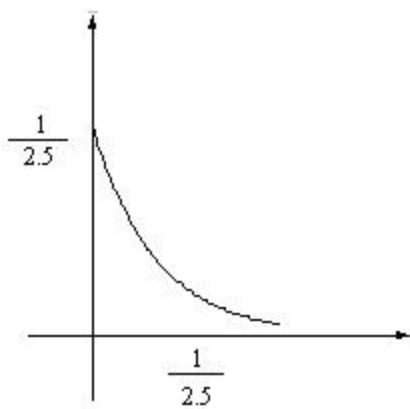
- B



- C



- **D**



Solution:

B

Exercise:

Problem:

Find the probability that a randomly selected seventh–grade student spends less than \$4 a day on food.

- **A**0.7981
- **B**0.2019
- **C**0.9999
- **D**0.0001

Solution:

A

Exercise:

Problem:

85% of the seventh–grade students spend more than what amount per day?

- A\$2.12
- B\$0.75
- C\$4.74
- D\$0.41

Solution:

D

Questions 4 – 5 refer to the following:

The amount of time that intermediate algebra students at Leland High School spend doing their homework per day is normally distributed with a mean 1.5 hours and standard deviation 0.75 hours.

Exercise:

Problem:

If one student is randomly chosen, what is the probability that the student does intermediate algebra homework at least 2 hours per day?

- A0.7475
- B0.4259
- C0.2525
- D0.6784

Solution:

C

Exercise:

Problem:

60% of these students spend at most how many hours doing their homework?

- A 1.69 hours
- B 1.31 hours
- C 1.5 hours
- D 0.2533 hours

Solution:

A

Questions 6 – 7 refer to the following:

Llamas are excellent pack animals. It is known that the weight of supplies carried by llamas follows a normal distribution with a mean of 62.5 pounds and a standard deviation of 6 pounds.

Exercise:

Problem:

Find the probability that the weight of supplies carried by one randomly chosen llama is between 60 and 70 pounds.

- A 0.4441
- B 0.5559
- C 0.8944
- D 1

Solution:

B

Exercise:**Problem:**

The middle 50% of weights of supplies carried by a randomly chosen llama is between _____ and _____.

- A 0 and 62.5 pounds
- B 58.45 and 66.55 pounds
- C 56.5 and 68.5 pounds
- D There is not enough information given.

Solution:

B

Exercise:

Problem: Which of the following are true for the normal distribution?

- I More values fall close to the mean than fall far away from the mean.
 - II The mean and standard deviation cannot be the same.
 - III A change in μ causes the graph to shift to the left or right and changes the shape of the graph.
 - IV A change in s causes a change in the shape of the normal curve.
-
- A I, IV
 - B I, II, III, IV
 - C I, II, III
 - D III, IV

Solution:

A

Questions 9 – 13 refer to the following:

The length of time junior high school students sleep per night follows an approximate uniform distribution from seven to eleven hours. Suppose we randomly select a junior high student.

Exercise:

Problem:

Find the probability that the randomly selected student sleeps less than $8\frac{1}{2}$ hours per night.

- A.2143
- B0.7727
- C0.4705
- D0.375

Solution:

D

Exercise:

Problem:

Find the probability that the randomly selected student sleeps eight to twelve hours per night.

- A0
- B1
- C0.75
- D0.25

Solution:

C

Exercise:

Problem:

On average, how long does a junior high school student sleep per night?

- A.2143
- B0.7727
- C0.4705
- D0.375

Solution:

B

Exercise:**Problem:**

On average, how long does a junior high school student sleep per night?

- A9.6 hours
- B6.5 hours
- C7.8 hours
- D8.4 hours

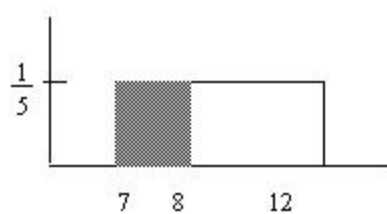
Solution:

D

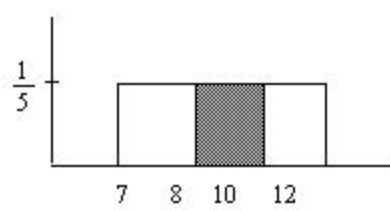
Exercise:**Problem:**

We are interested in the probability that a randomly selected student sleeps less than eight hours, knowing that he/she sleeps less than ten. Which graph best depicts this situation?

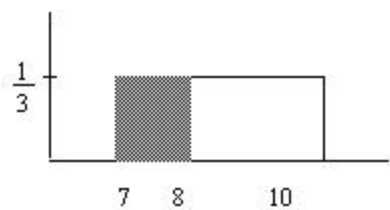
- A



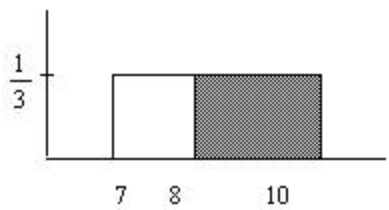
- B



- C



- D



Solution:

C